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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/740,760	11/29/2000	Allen R. Davis	CC-0308	4311

7590

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EXAMINER
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WANG, GEORGE Y

ART UNIT	PAPER NUMBER
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2871

DATE MAILED: 01/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

### Application No.

09/740,760

### Applicant(s)

DAVIS ET AL.

### Examiner

George Y. Wang

### Art Unit

2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 25-30, 32-37 and 39-76 is/are pending in the application.
- 4a) Of the above claim(s) 67-76 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-30, 32-37 and 39-66 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Applicant Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 November 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_. 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. This application contains claims directed to the following patentably distinct species of the claimed invention:

(1) the specifics of the apparatus for sensing fluid flow within a pipe comprised of an acoustic sensing device and a flow velocity sensing device comprising a first embodiment corresponding to claims 25-46;

(2) the specifics of the apparatus for sensing fluid flow within a pipe comprised of an acoustic sensing device, a flow velocity sensing device, and a housing comprising a second embodiment corresponding to claims 47-66;

(3) the specifics of the apparatus for sensing fluid flow within a pipe comprised of an array of optical sensors for acoustic pressure variations, an array of optical sensors for local pressure variations, and a signal process circuitry device of a third embodiment corresponding to claims 67-76.

2. Newly submitted claims 67-76 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The claimed invention in claims 67-76 comprise of a system for sensing fluid in a pipe with optical sensor arrays coupled to a signal processing circuit. These limitations present an invention that is distinct and separate from that which was originally presented.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 67-76 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 25-26 and 30-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Berthold et al. (U.S. Patent No. 5,845,033, from hereinafter "Berthold") in view of Kluth (U.S. Patent No. 5,804,713).

5. As to claim 25, Berthold discloses an apparatus for sensing flow within a pipe (fig. 1, ref. 10) using a flow velocity sensing device (fig. 1, ref. A) attached to the outside wall of the pipe to provide a velocity signal indicative of local pressure variations within the pipe.

However, the reference fails to specifically disclose an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of the acoustic pressure variations within the pipe.

Kluth discloses an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of the acoustic pressure variations within the pipe (col. 4, lines 44-57).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have also included an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of the acoustic pressure variations within the pipe since one would be motivated by applications that include sand detection, pump, monitoring, and fluid monitoring (col. 4, lines 44-57). Furthermore, acoustic sensors are well known in the art and benefit from very high bandwidth while having low sensitivity, which make for highly efficient detection (col. 4, lines 44-57).

6. As to claim 31 and 38, Berthold discloses an apparatus for sensing flow within a pipe (fig. 1, ref. 10) using a flow velocity sensing device (fig. 1, ref. A) attached to the outside wall of the pipe to provide a velocity signal indicative of local pressure variations within the pipe.

However, the reference fails to specifically disclose an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of speed of sound within the pipe.

Kluth discloses an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of the speed of sound within the pipe (col. 4, lines 44-57).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have also included an acoustic sensing device attached to the outside wall of the pipe to provide a signal indicative of the speed of sound within the pipe since one would be motivated by applications that include sand detection, pump, monitoring, and fluid monitoring (col. 4, lines 44-57). Furthermore, acoustic sensors are well known in the art and benefit from very high bandwidth while having low sensitivity, which make for highly efficient detection (col. 4, lines 44-57).

7. As to claim 26, Berthold discloses the apparatus as recited above with an optical source optically connected to provide optical power to the sensors (fig. 1, ref. 18).

8. Regarding claims 30, 32-37, and 39-46, Berthold discloses the apparatus as recited above with fluid velocity sensors comprises a plurality of sensors (fig. 1, ref. A, B, C), which are evenly spaced (fig. 1, ref. "gauge length") to sense the fluid flow (abstract), made up of optical fiber sensor that coil around the pipe (fig. 8), and separated by Bragg gratings (abstract).

However, the reference fails to specifically disclose an acoustic sensing device comprising a plurality of sensors, which are evenly spaced to sense the speed of sound, made up of optical fiber sensor that coil around the pipe, and separated by Bragg gratings.

Kluth discloses an acoustic sensing device comprising a plurality of sensors (fig. 3, ref. 2), which are evenly spaced to sense the speed of sound, made up of optical fiber sensors that coil (fig. 3, ref. 35) around the pipe.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate an acoustic sensing device comprising a plurality of sensors, which are evenly spaced to sense the speed of sound, made up of optical fiber sensor that coil around the pipe, and separated by Bragg gratings since one would be motivated by applications that include sand detection, pump, monitoring, and fluid monitoring (col. 4, lines 44-57). Moreover, acoustic sensors are well known in the art and benefit from very high bandwidth while having low sensitivity, which make for highly efficient detection (col. 4, lines 44-57). In addition, Bragg gratings are well known in the art and one of ordinary skill in the art would recognize its benefits in acoustic sensors

and optical multiplexing as well (Berthold, *abstract*), especially in sensing shifts in wavelengths.

9. Claims 27-29 and 47-66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Berthold and Kluth, and in further view of Layton et al. (U.S. Patent No. 5,363,342, from hereinafter "Layton").

10. Regarding claims 27-29, 47, and 49-51, Berthold and Kluth disclose the apparatus as recited above, however, the references fail to specifically disclose a housing, which encloses the sensing arrays and forms a pressure vessel having an annular region between housing and pipe.

Layton discloses a housing, which encloses the sensing arrays and forms a pressure vessel having an annular region between housing and pipe (fig. 3, ref. 34).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated a housing, which encloses the sensing arrays and forms a pressure vessel having an annular region between housing and pipe since one would be motivated to not only protect the sensor coils around the pipe, but to also increase the framework for which the sensors operate (col. 4, lines 33-45).

Furthermore, a housing support forms an air gap (fig. 46b) around the pipe, such that the scale factor of acoustic sensitivity would increase (col. 6, lines 51-60) and provide greater compliance to detect acoustic and pressure variations and impedance mismatches (col. 5, lines 6-17).



11. As to claim 48, Berthold discloses the apparatus as recited above with an optical source optically connected to provide optical power to the sensors (fig. 1, ref. 18).

12. Regarding claims 52-66, Berthold discloses the apparatus as recited above with fluid velocity sensors comprises a plurality of sensors (fig. 1, ref. A, B, C), which are evenly spaced (fig. 1, ref. "gauge length") to sense the fluid flow (abstract), made up of optical fiber sensor that coil around the pipe (fig. 8), and separated by Bragg gratings (abstract).

However, the reference fails to specifically disclose an acoustic sensing device comprising a plurality of sensors, which are evenly spaced to sense the speed of sound, made up of optical fiber sensor that coil around the pipe, and separated by Bragg gratings.

Kluth discloses an acoustic sensing device comprising a plurality of sensors (fig. 3, ref. 2), which are evenly spaced to sense the speed of sound, made up of optical fiber sensors that coil (fig. 3, ref. 35) around the pipe.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate an acoustic sensing device comprising a plurality of sensors, which are evenly spaced to sense the speed of sound, made up of optical fiber sensor that coil around the pipe, and separated by Bragg gratings since one would be motivated by applications that include sand detection, pump, monitoring, and fluid monitoring (col. 4, lines 44-57). Moreover, acoustic sensors are well known in the art

and benefit from very high bandwidth while having low sensitivity, which make for highly efficient detection (col. 4, lines 44-57). In addition, Bragg gratings are well known in the art and one of ordinary skill in the art would recognize its benefits in acoustic sensors and optical multiplexing as well (Berthold, *abstract*), especially in sensing shifts in wavelengths.

### ***Response to Arguments***

13. Applicant's response filed 25 March 2003 contains no arguments. As such, in light of the above, Examiner maintains the validity of the references and maintains rejection.

### ***Conclusion***

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2871


the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Y. Wang whose telephone number is 703-305-7242. The examiner can normally be reached on M-F, 8 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on 703-305-3492. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

gw  
December 23, 2003

  
ROBERT H. KIM  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800